Northern Spotted Owl Effectiveness Monitoring
Northwest Forest Plan

S. Sovern

2002 Annual Summary Report

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Northern Spotted Owl Monitoring Team

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Northern Spotted Owl Effectiveness Monitoring
Annual Summary Report for 2002

Executive Summary

The ninth consecutive year of monitoring northern spotted owl (*Strix occidentalis caurina)* populations under the Northwest Forest Plan was completed in 2002. Surveys of the eight demography study areas provided information on occupancy, survival, and reproduction from over 1100 spotted owl sites. Spotted owl pairs were present at 52% of the sites surveyed. The percent of the female owls nesting, across the eight study areas, ranged from 48.1% to 83% and the number of young fledged per area ranged from 16 to 98. The total number of young fledged was 445 compared to 492 in 2001.

A draft habitat map was produced for the Western Cascades Province in Oregon using a rule set of habitat attributes to query the Interagency Vegetation Mapping Project (IVMP) map product. An innovative methodology used owl activity centers as reference polygons to develop the rule set that translated the attributes of the vegetation map into owl habitat attributes.

The predictive model development research team completed the analyses of demographic rates in relation to vegetative characteristics on the Roseburg BLM, H.J. Andrews Forest and Medford BLM study areas. Initial work was begun on models to predict occupancy.

The final outline and monitoring questions for the spotted owl chapter of the Northwest Forest Plan Monitoring Interpretive Report were submitted for review. The workshop to analyze population data was scheduled for January, 2004. Cooperators began assembling empirical data on occupancy and reproduction in the demographic areas as well as providing information on re-sightings of previously banded owls for an analysis of owl movement.

Introduction

The purpose of the Northern Spotted Owl Effectiveness Monitoring Plan is to assess trends in spotted owl populations and their habitat relative to meeting the Plan goal. The primary goal is to evaluate the success of the Northwest Forest Plan (the Plan) in arresting the downward trend in spotted owl populations and in maintaining and restoring the habitat conditions necessary to support viable populations of the northern spotted owl on federally-administered forest lands throughout the owl's range (Lint et al. 1999).

The primary objectives of the monitoring plan for these lands are to:

> Assess changes in population trend and demographic performance of spotted owls on federally-administered forest lands within the owl's range.
>
> Assess changes in the amount and distribution of nesting, roosting, foraging (NRF) habitat, and dispersal habitat for spotted owls on federally administered forest lands.

The cornerstones of the spotted owl effectiveness monitoring strategy are population and habitat assessment. Integrating data from population and habitat monitoring is being explored through research to develop predictive models (that is, predicting owl population status from the state of the habitat). This report summarizes the activities in fiscal year (FY) 2002 monitoring owl populations, assessing owl habitat and developing predictive models.

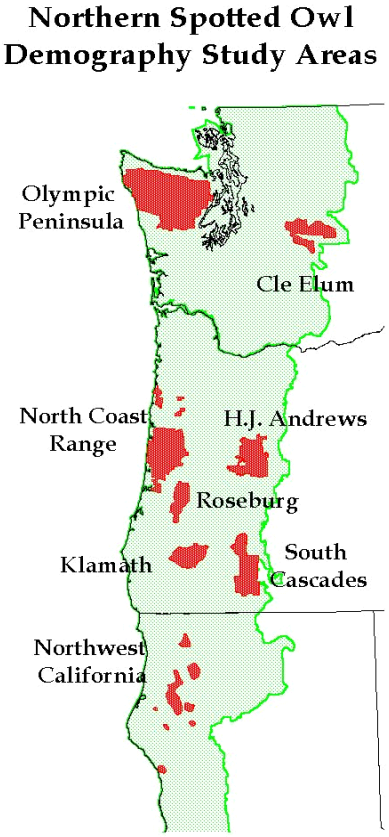


Figure 1. Map of Spotted Owl Demography Study Areas

Methods

Population Monitoring

Under the plan, the owl population is monitored annually in eight demographic study areas (Figure 1) between March 1 and August 31 to determine the occupancy, survival, and reproductive success of the marked owls inhabiting them. Individual spotted owls are located during daytime and nighttime surveys by imitating their call to elicit a response. Once a spotted owl responds, it is observed to determine if it is marked. If marked, the band color /leg banded combination is checked for correspondence with records on the known marked birds at that location. If the observation matches the historic banding record the owl is tallied as present and accounted for. If they do not correspond, the bird is captured and the U.S. Fish and Wildlife Service (FWS) numbered leg band is read to identify the origin of the individual owl. It is counted as present, and its new location is noted. Likewise, attempts are made to capture all

unmarked birds and those captured are banded with a color band and a FWS numbered leg band. Each bird encountered is classified as to sex and age-class based upon vocalization, band identification or physical characteristics.

Reproduction information is obtained by feeding individual adult owls live mice and determining whether the owl is a member of a nesting pair based upon the behavior of the owl. If the male is given a mouse and its mate is nesting he will usually deliver the mouse to the nesting female enabling the observer to identify the nest tree. By returning to the nest tree in June and again feeding the adults live mice, the observer can determine if young are present. Counts of number of pairs, number of young fledged and occurrence of marked individuals are made. These data are later analyzed to provide estimates of survival, reproduction and annual rate of population change (lambda).

Habitat Map Development

Province-level habitat maps covering the range of the northern spotted owl will be compiled and analyzed to track the trend in the amount and distribution of habitat. In Northern California, the CalVeg vegetation mapping layer compiled by Region 5 of the Forest Service will serve as the base map for deriving the owl habitat map for that portion of the range. In Oregon and Washington, the owl habitat map will be derived from province-level vegetation maps produced by the Interagency Vegetation Mapping Project. Rule sets describing owl habitat will be formulated using the attribute information for the respective vegetation maps. Owl habitat maps will be derived from the vegetation maps by applying the rule sets to reclassify the vegetation maps. Habitat map development will track closely with the process for assessing late-successional/old-growth (LS/OG) forest condition and trend since both the owl habitat map and the LS/OG maps will be derived from the same vegetation map products. Owl habitat map development is targeted for completion by the summer of 2003.

Predictive Model Development

The predictive model development element of the monitoring plan is a research effort designed to determine if landscape habitat composition and pattern can be used to predict abundance (occupancy) and demographic performance of northern spotted owls. If landscape composition and pattern are shown to be reliable predictors of owl abundance and demographic performance, then monitoring spotted owl populations may shift, in some areas, to a habitat-based strategy.

The specific objectives of the project include summarizing the abundance and demographic performance of spotted owls at the home range and landscape scales, characterizing landscape composition and patterns for home ranges and landscapes, developing statistical models relating abundance and demographic performance of owls to landscape characteristics for a subset of home ranges in the demographic study areas, validating the statistical models by testing them on the remaining home ranges, and using the statistical models to develop or refine existing spatially explicit models for spotted owls.

Results

Population Monitoring

Occupancy

Owls were surveyed between March and August of 2002 in each of the eight demographic areas. A total of 1,111 sites were surveyed; 578 (52%) of the sites were found to be occupied by territorial pairs of spotted owls and an additional 109 (9.8%) sites had single owls present (Table 1). Pair occupancy values ranged from a high of 64.7% of the sites in the Klamath Mountains Province in Oregon to a low of 27.3% in the Cle Elum study area (Washington Eastern Cascades Province). The three year average for pair occupancy across all study areas was 50.4% (47.2-52.1%).

Frank Oliver

Figure 2. Biologist in search of spotted owls in southern Oregon.

Table 1. Summary of spotted owl occupancy by demography area for 2002[a]

Demographic area	Sites surveyed (*number*)	Sites with a territorial pair (*number*)	(*%*)	Sites with a resident single owl (*number*)	(*%*)
Olympic Peninsula	135	67	49.6	22	16.3
Cle Elum	66	18	27.3	6	9.1
H.J. Andrews	161	87	54.0	11	6.8
North Coast	204	88	43.1	38	18.6
Roseburg	140	80	57.1	5	3.6
South Cascades	162	83	51.2	9	5.6
Klamath	150	97	64.7	11	7.3
Northwestern California	93	58	62.4	7	7.5
TOTALS	**1111**	**578**	**52.0**	**109**	**9.8**

[a]Preliminary data from Alan Franklin Pers. Comm. 2003, Anthony et al. 2002a, 2002b,; Lint et al. 2003, Eric Forsman Pers. Comm. 2003, Forsman et al. 2002b, 2002c, 2002d, ; values may change in the final analysis.

Reproduction

Survey efforts in March through May of 2002 focused on determining the owls' nesting status. In June through July, those sites identified as nesting were revisited to gather information on the number of young fledged. Nesting varied across the eight demographic areas: the Olympic Peninsula had 83% of the females nesting, the South Cascades (Oregon) had 79.0% and Klamath, 65.6%. Percent nesting values for the other five study areas ranged from 48.1% to 62.0%.

Fecundity values ranged from highs of 0.649 in the South Cascades study area and 0.563 in the Olympic Peninsula to lows of 0.174 in the North Coast study area (Oregon) and 0.290 in the Northwest California study (Table 2). The total number of young fledged in 2002 was 445 compared to 492 in 2001 and 344 in 2000.

Jason Mowdy

Figure 3. Fledgling spotted owl perched next to large, broken-topped nest tree

Table 2. Summary of spotted owl reproduction by demography area for 2002[a]

Demographic area	**Females Nesting** (*%*)	**Young Fledged** (*number*)	Fecundity[b]
Olympic Peninsula	83.0	71	0.563
Cle Elum	58.8	16	0.420
H.J. Andrews	62.0	60	0.400
North Coast	48.1	31	0.174
Roseburg	57.7	51	0.313
South Cascades	79.0	98	0.649
Klamath	65.6	83	0.428
Northwestern California	48.3	35	0.290
TOTALS	*	445	0.396

[a]Preliminary data from Alan Franklin Pers. Comm. 2003, Anthony et al. 2002a, 2002b,; Lint et al. 2003, Eric Forsman Pers. Comm. 2003, Forsman et al. 2002b, 2002c, 2002d, ; values may change in the final analysis.

[b]Number of female young fledged per territorial female (assumed 1:1 sex ratio of young).

Owl banding and reobservation

Individual owls, without bands, were captured and banded with USGS aluminum, numbered leg bands and colored leg bands in each of the study areas. Previously banded owls were identified by recapture and recording the number on the leg band or frequently, by the reobservation of the colored leg band while the owl was in flight or feeding on prey near the observer. The data collected from banded owls are used in subsequent analysis to determine survival rates, turnover rates, and geographic movements of owls. In 2002, 1,201 adult and subadult northern spotted owls were either initially banded or reobserved and 424 fledglings (95.0 %) were banded and released for future reobservation (Table 3). Over the past three years, 1,205 of 1,284 (94%) fledgling owls were banded.

Jason Mowdy

Figure 4. Adult spotted owl with color band (blue) on the left leg and an aluminum, numbered band on the right leg. The color band permits identification of individual owls without recapture.

Table 3. Summary of spotted owl banding and reobservation by demographic area for 2002[a]

Demographic Area	Adults/subadults banded or reobserved (*no.*)	Juveniles banded (*no.*)
Olympic Peninsula	138	71
Cle Elum	40	16
H.J. Andrews	184	63
North Coast	186	28
Roseburg	178	51
South Cascades	154	87
Klamath	197	74
Northwestern California	124	34
Totals	1201	424

[a]Preliminary data from Alan Franklin Pers. Comm. 2003, Anthony et al. 2002a, 2002b,; Lint et al. 2003, Eric Forsman Pers. Comm. 2003, Forsman et al. 2002b, 2002c, 2002d, ; values may change in the final analysis.

Barred Owls

As reported in past years, the number of barred owls detected is continuing to increase. In the Olympic National Park (ONP) portion of the Olympic Peninsula Demography Study Area, barred owls were recorded at 20 sites in 2002 bringing the total estimated number of barred owl sites in the ONP to 60 (Gremel 2002). Outside of the ONP, on the westside of the study area, barred owls were particularly common with 27% (18 of 66) of the sites surveyed occupied by barred owls (Eric Forsman Pers. Comm. 2003). When the Olympic Peninsula study was initiated in 1987, none of these sites were known to be occupied by barred owls.

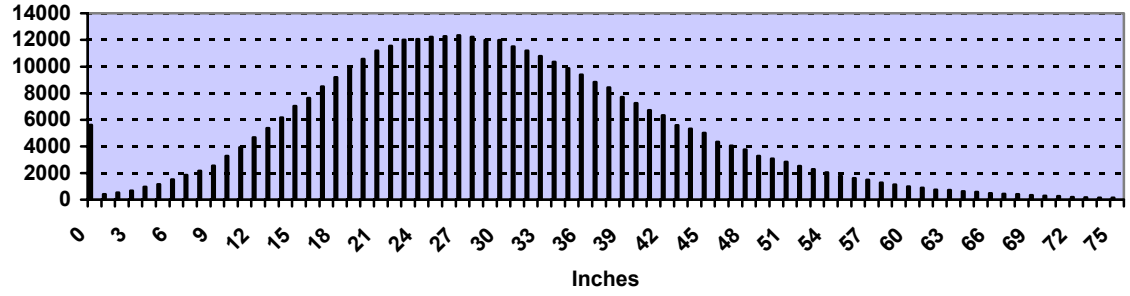
In the Cle Elum study area, Forsman et al. (2002d) estimate there are 31 different barred owl territories in the study area. Further south in the range, in the Klamath and Tyee (Roseburg) Demography Study Areas, over 60 non-juvenile barred owls were detected in 2002 (Lint et al. 2003 and Forsman et al. 2002b). Reproduction by barred owl pairs was documented in the Klamath study area with one pair producing triplets.

Habitat Map Development

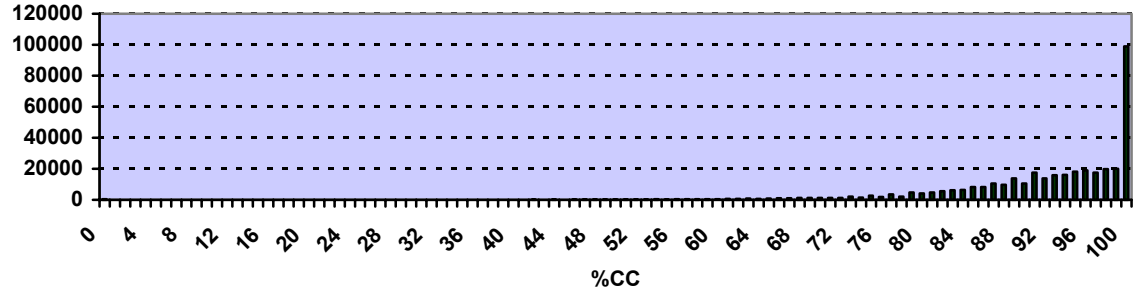
The habitat map development team explored an innovative method to create a "rule set" for querying the IVMP map products to derive province owl habitat maps. A pilot test of the method was conducted in the Oregon Western Cascades Province (OWCP). The methodology employed a digital layer of polygons delineated around spotted owl activity centers (USDA and USDI 1994). The polygons served as reference areas since they were known locations of occupied habitat. The polygon layer was intersected with the IVMP map for the OWCP (Ray Davis Pers. Comm. 2002) resulting in a distribution of the pixel values for quadratic mean diameter (QMD) and percent conifer cover (PCT_CC) that occurred in the collection of polygons (Figure 2).

The first generation "rule set" was created by using the values for QMD and PCT_CC that were one standard deviation below the mean. This resulted in a description for nesting/roosting/ foraging habitat of pixels ≥17 inches QMD and ≥82% PCT_CC. The rule set was expanded to encompass the broader range of habitat represented by foraging locations outside of the activity

5a



5b



Figures 5a and 5b. Histograms of Quadratic Mean Diameter (QMD) (5a) and Percent Canopy Cover – Conifer (PCT_CC (conifer)) (5b) for owl activity center polygons in the Oregon Western Cascades Physiographic Province (Ray Davis Pers. Comm. 2002).

centers and to represent habitat used by dispersing juveniles. The expansion was accomplished by using a data set of 7000-plus radio telemetry locations collected between 1975 and 1988 in the H.J. Andrews Experimental Forest located in the central portion of the OWCP (Ray Davis Pers. Comm. 2002). The value for QMD that was minus one standard deviation from the mean was 11 inches and the corresponding value for PCT_CC was ≥64%. Further testing and refinement of the methodology will occur as work progresses on development of habitat maps for other provinces.

The method uses known owl habitat use areas to derive the range of pixel values that represent owl habitat for the IVMP map products. This makes it a repeatable process for determining the range of attributes from a given province IVMP map that represent spotted owl habitat.

Predictive Model Development

Two projects examining the demographic performance of spotted owls in relation to habitat conditions used data from demography study areas in the central-portion of the Oregon Coast Range and the H.J. Andrews Experimental Forest in the Oregon Western Cascades Range. A separate project, not reported here, also examined the habitat characteristics and owl demography on three areas in the Medford District of the BLM. This project, although not funded under the effectiveness monitoring program, followed similar analyses methods as the two studies mentioned above.

In both the Coast Range and Western Cascades projects, the investigators continued to work with multiple map products to facilitate the comparison among map products and to provide a better understanding of the efficacy of the IVMP map product. In the Western Cascades study, two maps derived from satellite data were used; the IMVP map and one developed by Cohen et al. (1995). An aerial photo based map developed by the Willamette National Forest was also used. The analysis indicated that the three maps provided very similar estimates of cover type composition around spotted owl centers, but greater differences for landscape patterns (Anthony et al. 2002c). Concerns were identified for classifying owl habitat in the mid seral classes, due in part to the absence of forest structure data.

Modeling of demographic rates indicated that habitat was not a reliable predictor of productivity and survival rates in the central Oregon Cascades explaining only 31% and 1% of the variability, respectively (Anthony et al. 2002c). Among several possible reasons for this result, the authors believed that the primary reason was "that there is enough high quality habitat on the H.J. Andrews study area that habitat had only a minor effect on survival and productivity rates." This is bolstered by their findings in the Coast Range study area where results indicated that survival rates are relatively high when there was >40% old conifer habitat around nest centers, but survival rates declined as the amount of old conifer habitat declined around nest centers (Anthony et al. 2002c and Olson et al. *In prep*).

Modeling in the Oregon Coast Range revealed that a mixture of mid- and late seral forest with early seral and non-forest seemed better for owls in terms of both survival and productivity (Olson et al. *In prep*). Results for the survival model showed it only accounted for 16% of the variability in the data while on the productivity side , that model explained 85% of the variability with only 2.3% attributable to habitat – parent age and temporal factors accounted for the most (Olson et al. *In prep*).

2004 Monitoring Interpretive Report

In 2002, additional progress was made toward the completion of the spotted owl chapter of the Northwest Forest Plan Monitoring Interpretive Report scheduled for release in 2004. Cooperating scientists made initial contacts for scheduling and participation in the January, 2004 workshop to analyze the status and trend of spotted owl population data from demographic study areas. Data analyses and summaries from the workshop will provide the basis for the population discussion in the interpretive report.

The habitat map development team made significant progress and produced a first-generation map of habitat for the Oregon Western Cascades Province. The resulting habitat data will provide information for the interpretive report on the effectiveness of the Northwest Forest Plan in maintaining and restoring spotted owl habitat. Although the report will provide some insight into status and trend of owl population and habitat over the first ten years of Plan implementation, it will also provide a baseline for comparison of future monitoring results.

Discussion

In 2001, the South Cascades study area had the lowest percent of females nesting while in 2002 it was the exact opposite with the South Cascades study area having one of the highest percent of females nesting with 79%. This is indicative of the pattern of high and low reproductive years alternating with even and odd years, respectively.

The low occupancy rate in the Cle Elum study area is the product of a continuing decline, beginning in 1992, in the overall number of owls detected. In 1992, the survey of 72 sites detected 120 owls. Surveys in 1998 checked 78 sites and detected 78 owls. The 2002 survey effort involved 66 sites and detected only 44 owls. This translates to a decline of approximately 60% in the number of occupied territories in the study area since 1992 (Forsman et al. 2002d). Whether the decline in detections are a result of barred owls (refer to Barred Owl section of this report), harvest on non-federal lands, short-term weather patterns, or a combination of the above is unknown (Forsman et al. 2002d).

The presence of barred owls and their relationship to spotted owl site occupancy and productivity received continued attention in the monitoring program. These data are gathered commensurate with the spotted owl survey effort, thus the costs for data gathering is minimal and may be important to explaining spotted owl occupancy, or the lack thereof, in otherwise suitable habitat.

Two recaptures of previously banded juveniles from the Klamath Study Area south of Roseburg were noteworthy due to the distance the birds traveled. One owl, banded in 1998, was reobserved 74 miles to the east of the original banding location while a second owl was located 58 miles to the south. The maximum distance reported for a band recovery of a spotted owl by Forsman et al. (2002a) was 69 miles.

Significant progress on development of owl habitat maps was possible by the innovation of using the owl activity center polygons as known habitat reference areas (Ray Davis, pers. comm. 2002). This methodology allows the IVMP maps to be sampled to determine the range of attribute values that best characterize owl habitat. The results using this methodology were encouraging and the hope is that it will provide a consistent and repeatable process for rule set development across provinces.

Monitoring Program Considerations

No province or range-wide analyses were scheduled or conducted in FY 2002 for any of the spotted owl monitoring program elements. Information gathered in FY 2002 will be analyzed in the next meta-population analysis scheduled for January 2004, and the monitoring interpretive report is scheduled for completion in the fall of 2004.

In FY 2003, a team of scientists and managers will continue review of the spotted monitoring strategy to assess the adequacy of the information being gathered to serve the needs of decision-makers. Findings from this review will be considered in determining the direction for monitoring spotted owls during the second decade of Northwest Forest Plan implementation.

Recommendations for 2003 Field Season

Population monitoring will continue in all eight demography study areas in 2003. Field crews for six of the seven demography study areas in Oregon and Washington will be hired through an agreement between Region 6 of the Forest Service and Oregon State University.

Work in FY 2003 will focus on continued testing of the owl polygon/IVMP map intersection methodology while completing habitat maps for all physiographic provinces in the range of the spotted owl. Habitat analysis will use the IVMP derived owl habitat maps to characterize the amount and arrangement of owl habitat in the Late-Successional Reserve and Matrix land use allocations of the Northwest Forest Plan.

The predictive model development work will focus on the areas listed below.

1) Modeling the demographic rates in relation to vegetation characteristics for the Olympic Peninsula and the Oregon Coast Range.

2) Analysis of occupancy rates for Oregon Coast Range (Roseburg and Siuslaw) and the Western Oregon Cascades (H.J. Andrews).

An analysis of owl movement across the landscape relative to the Late-Successional Reserve and Matrix land use allocations of the Northwest Forest Plan will be initiated.

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Key Partners

USDA Forest Service, Pacific Northwest Research Station, Corvallis, OR and Olympia, WA

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Budget Information

Budget information for FY 2002 is provided in the following table.

Table 4. Spotted owl effectiveness monitoring funding by monitoring element and contributing agency in fiscal year 2002

Element name	Funding Agency Contribution (thousands of dollars)								
	USFS				*BRD*	*BLM*	*NPS*	*FWS*	**Funding total**
	Region 5	**Region 6**	**PNW**	**PSW**					**By element or task**
Demographic Areas	298.6	993.2	43.0	--	--	640.0	140.0	--	2114.8
Habitat map	--	11.0	--	--	--	--	--	0.0	11.0
Predictive models	--	--	201.0	--	133.0	--	--	--	334.0
Coordination and management	--	--	--	--	--	60.0	--	--	60.0
Funding subtotal	298.6	1004.2	244.0	0.0	133.0	700.0	140.0		
Funding total by agency		**1546.8**			**133.0**	**700.0**	**140.0**	**0.0**	**2519.8**